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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/812,354 | FUKIAGE, NORIAKI | |
| | Examiner | Art Unit | |
| | DAVID TUROCY | 1792 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on 10 December 2008.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-28 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-28 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. The Amendments of 12/10/08, were received and have been entered. The examiner notes the amendment to claims 1, 3-6, 11-16, and 19. Claims 1-28 are currently pending in the instant application.

### *Response to Arguments*

2. Applicant's arguments filed 6/5/2008, have been fully considered but they are not persuasive. Applicant's arguments regarding the new limitations are unconvincing in view of the newly cited references for the reasons cited below. These limitations have now been properly addressed in the prior art the follows.

3. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**5. Claims 1 – 4, 11, 13, 14, 16 – 18, 24, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukune, et al. (European Patent Application 0 387 656 A1, hereafter Tsukune) in view of Ravi (United States Patent 5,952,060), Taylor, et al. (United States Patent 5,882,424, hereafter Taylor), Maydan, et al. (United States Patent 6,109,206, hereafter Maydan), Reiss, et al. (United States Patent Application Publication US 2003/0014145 A1, hereafter Reiss), and Satoh et al. (United States Patent Application Publication US 20020011210 A1, hereinafter Satoh) and further in view of US Patent 4960488 by Law et al and US Patent 6846745 by Papasouliotis.**

6. Regarding Claim 1, Tsukune teaches a method for operating a plasma enhanced chemical vapor deposition (PECVD) system, the method comprising: a) performing a chamber seasoning process, comprising a chamber cleaning process and a chamber and a chamber pre-coating process (see Column 2, lines 1 – 9), wherein the chamber cleaning process uses a first RF source to form a plasma in a processing chamber with $NF_3$ (see Column 3, lines 6 – 10) and wherein the chamber pre-coating process uses

$SiH_4$ and $N_2$ (see Column 3, lines 11 – 18); b) positioning a substrate on a substrate holder in the processing chamber (see Column 3, lines 19 – 22); and c) depositing a film on the substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process (see Column 3, lines 22 – 28). While Tsukune does not explicitly teach removing the substrate from the processing chamber, it is an inherent feature of coating processes that the article being coated is removed from the system after the processing is complete – the article being coated is not intended to be left in or used only in the reactor system.

7. Tsukune does not teach the limitations of Claim 1 that the method be a method for operating a PECVD system to improve wafer to wafer film thickness uniformity; that the chamber cleaning process uses a remote plasma device and a second RF source to form a plasma in a processing chamber; and that the method further comprises measuring the film on the substrate using an integrated metrology module configured to measure wafer film thickness.

8. Regarding the first limitation that the method be a method for operating a PECVD system to improve wafer to wafer film thickness uniformity, Tsukune does not explicitly teach the method wherein multiple substrates are processed within the chamber such that there is a wafer to wafer film thickness uniformity parameter. However, Ravi teaches just such a limitation, wherein multiple substrates are processed within the chamber (see Claim 13, and Column 1, lines 24 – 35) in a process that involves both chamber cleaning and chamber pre-coating (see Figures 3 and 4). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present

invention to have modified the method taught by Tsukune by processing multiple substrates as taught by Ravi, because Ravi teaches that it is known to process multiple substrates in a process employing both chamber cleaning and chamber seasoning and because it is obviously advantageous to process more than one substrate in a method for processing substrates.

9. Still regarding the limitation of Claim 1 that the method be a method for operating a PECVD system to improve wafer to wafer film thickness uniformity, which is not taught by Tsukune in view of Ravi, it is well known in the art to process separate wafers by depositing films with the same thicknesses thereon based upon the desired properties and end uses of the substrates/wafers being coated. By depositing films on different substrates with the same thicknesses, the wafer to wafer film thickness uniformity is inherently improved. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi by depositing films with the same thicknesses upon different substrates, thereby improving the wafer to wafer film thickness uniformity, because it is known in the art and is advantageous to use the same chamber to process substrates which are to be coated with films of uniform thicknesses depending upon the desired substrate function.

10. Regarding the second limitation of Claim 1 that the chamber cleaning process uses a remote plasma device and a second RF source to form a plasma in a processing chamber, which is not taught by Tsukune in view of Ravi, Taylor and Maydan teach the use of these parts in a chamber cleaning process. Specifically, Taylor teaches, in

Column 3, lines 41 – 43, "an apparatus and method for cleaning the aforementioned vacuum chamber where at least two different RF power signals are employed [to realize the objectives]," wherein the objectives, taught in Column 3, lines 19 – 26, are "devices and methods for cleaning the interior surfaces of a plasma CVD or etch reactor … which will reduce or eliminate the need to employ "greenhouse gases," … and reduc[ing] the cleaning times, without sacrificing the thoroughness of the cleaning, so as to improve the throughput of the plasma reactor." Taylor further teaches, in Column 6, lines 66 and 67 and Column 7, lines 1 – 4, that "Although the low frequency excitation has advantages in a plasma cleaning operation, its use in combination with a high frequency excitation may provide additional advantages not available when low frequency is used alone. For example, a high frequency excitation field can provide more efficient method of igniting the plasma." Taylor also teaches, in Column 7, lines 48 – 51, that "the key point is that a mixed frequency excitation is produced by simultaneously coupling high and low frequency RF signals to the plasma, no matter what driving configuration is employed," and, in Column 7, lines 64 – 67, that "As with an exclusively low frequency cleaning operation, the power levels associated with a mixed frequency chamber cleaning process are preferably optimized so as to maximize the dissociation of the etchant gas." Moreover, both Tsukune (see Column 3, lines 6 – 10) and Taylor (see Column 6, lines 56 – 65) teach the use of $NF_3$ as the cleaning gas. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi by utilizing a mixed frequency excitation in the cleaning process which uses a first RF source and a

second RF source as taught by Taylor to have achieved the advantages taught by Taylor.

11. Still Regarding the second limitation of Claim 1 that the chamber cleaning process uses a remote plasma device, which is not taught by Tsukune in view of Ravi and Taylor, Maydan teaches, in Column 2, lines 43 – 54, “an HD—CVD tool using deposition ... of doped and undoped silicon dioxide capable of excellent gap fill and blanket film deposition ... The tool of the present invention includes: a dual RF zone inductively coupled plasma source; … and a remote plasma chamber cleaning system.” Specifically, Maydan teaches, in Column 19, lines 32 – 43, “For the remote microwave cleaning system in the present invention, it is preferred to use $NF_3$ … The desired cleaning reactions produced by the use of the remote plasma source proceed without any ion bombardment of the chamber or substrate support structures, therefore the need for cover wafers ... or periodic replacement of the critical chamber assemblies is avoided. Thus, a much more efficient use and throughput of the system is provided.” Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi and Taylor by utilizing a remote plasma device in the cleaning process as taught by Maydan to have achieved the advantages taught by Maydan.

12. Regarding the final limitation of Claim 1 that the method further comprises measuring the film on the substrate using an integrated metrology module configured to measure wafer film thickness, which is not taught by Tsukune in view of Ravi, Taylor, and Maydan, Reiss teaches just such a limitation. Specifically, Reiss teaches, in

Paragraph [0028], that “[the] wafer measurement subsystem is used to measure wafer properties before, during, and/or after wafer processing. These properties depend on the type of tool(s) at issue, and may include film thickness, uniformity, and the like. Wafer measurement subsystem may include in situ sensors capable of measuring wafer parameters in real-time during processing. Similarly, wafer measurement subsystem may include an integrated or inline sensor located within or proximate to process chambers for near real-time measurements... Examples of integrated or inline sensors include tools integrated with metrology techniques." Finally, Reiss teaches, in Paragraph [0024], that “in accordance with one or more embodiments of the present invention, a technique is provided for processing semiconductor wafers in conjunction with a manufacturing execution system using a run-to-run controller and a fault detection system… The run-to-run controller modifies the setpoints of the recipe according to the processing attributes (received from the fault detection system as well as e.g., other information gathering sources) to maintain the target wafer properties.” Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, and Maydan by utilizing a method comprising measuring the film on the substrate using an integrated metrology module configured to measure wafer film thickness as taught by Reiss to have achieved the advantages of such a method taught by Reiss, e.g. more precisely controlling target wafer properties.

13. Regarding the limitation to claim 1, which requires the remote plasma device is coupled to the processing chamber using a valve. Such is not explicitly taught by

Tsukune in view of Ravi, Taylor, Maydan, and Reiss. However, Satoh, teaching of a remote plasma generation means for plasma production discloses using valve with a stoppage function between the remote plasma discharge chamber and the downstream reaction chamber to reap the benefits of stopping reaction gas used when forming a film onto substrate within the reaction chamber from flowing backward or diffuse from the deposition chamber to the remote plasma discharge chamber (paragraph 0044). Therefore, taking the references collectively for all their teachings, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis to couple the remote plasma device to the process chamber using a valve to reap the benefits of stopping backward flow of gases as taught by Satoh.

14. *Regarding the added limitation to claim 1, which requires a translatable substrate holder and the first or second gap as claimed is not explicitly taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, and Satoh. However, the references collectively disclose cleaning the self-cleaning process, and Law discloses a self cleaning process, including upper electrode and a translatable substrate holder which forms a first and second gap during the cleaning process to provide for a local clean and a wide area cleaning process (Column 12-column 13). Law discloses gap distances for the local clean and wide area clean within the ranges as claimed (column 13).*

*15. Regarding the added limitation to claim 1, which requires the specifics of the silicon deposition process as claimed is not explicitly taught by Tsukune in view of Ravi,*

*Taylor, Maydan, Reiss, Sato, and Law. However, the references collectively disclose a chamber pre-coating process uses $SiH_4$ and $N_2$ as discussed above, and Papasouliotis discloses depositing CVD silicon containing coatings from various silicon precursors, including $SiH_4$, 3MS, TEOS, 4MS, DMDMS, OMCTS, TMCTS, $Si_2H_6$, and mixtures of the listed silicon precursors (Column 6, lines 55-68). Therefore, Papasouliotis discloses known silicon precursors for forming a silicon film in a CVD process and thus it would have been obvious to one of ordinary skill in the art to have modified Tsukune to use any number of silicon precursors, including 3MS or mixtures of 3MS and other silicon precursors, because Tsukune discloses depositing a silicon film using a silicon precursor and Papasouliotis discloses known and suitable precursor for the formation of silicon films.*

*16. As for the flow rates of the gases, the power level of the plasma, and the pressure of the chamber, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, Papasouliotis discloses silicon and inert gas flow rates within the range as claimed (column 7) and Law discloses power and chamber pressure within the range as claimed*

*(Column 12, lines 55-60). In the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.*

17. Regarding Claim 2, Ravi teaches the method further comprising: positioning a new substrate on the substrate holder in the processing chamber; depositing a film on the new substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process; and removing the new substrate from the processing chamber (see Claim 13, 15, and 16, Figure 4, and Column 9, lines 21 – 46).

18. Regarding Claims 3 and 4, Ravi teaches the method further comprising performing a post-process chamber cleaning process (see Claims 13 and 15, Figure 4, and Column 1, lines 35 – 52), and Tsukune teaches a cleaning process using $NF_3$ (see citations above). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by utilizing the cleaning gas taught by Tsukune in the post-process chamber cleaning process taught by Ravi, because Ravi teaches that the same cleaning process used in the overall process may be used as a post-process chamber cleaning process, and because Tsukune teaches that $NF_3$ may be used as a cleaning gas.

19. Regarding Claims 11, 13, and 16, Tsukune teaches the method wherein the chamber cleaning process employs $NF_3$, wherein the chamber pre-coating process

employs $SiH_4$, and wherein the chamber pre-coating process employs $N_2$ (see citations for Claim 1, above). Law discloses mixing silane gases and discussed above and therefore the combination of 3MS with the claimed gases in claim 13 would have been obvious to one of ordinary skill in the art because such would have led to predictable results.

20. Regarding Claim 14, Tsukune does not teach the method wherein the chamber pre-coating process employs $CH_4$ (methane). However, Ravi teaches just such a limitation (see Column 8, lines 51 – 67), in which methane is used as a precursor for the formation of diamond-like coatings in a pre-coating process. It would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune by using methane as the precursor in a chamber pre-coating process as taught by Ravi with a reasonable expectation of success, because Ravi teaches that methane can successfully be used for the deposition of diamond-like coatings in plasma deposition chambers (see Column 8, lines 11 – 67).

21. Regarding Claim 17, Taylor teaches the method as claimed in claim 1, wherein the chamber cleaning process further comprises: operating the first RF source at a frequency of 13.56 MHz; and operating the first RF source at a power of 110 – 500 W (see Column 8, lines 37 – 44).

22. Regarding Claim 18, Tsukune teaches the method as claimed in claim 1, wherein the chamber pre-coating process further comprises: operating the first RF source at a

frequency of 13.56 MHz; and operating the first RF source at a power of 300 W (see Column 3, lines 11 – 18).

23. Regarding Claims 24 and 25, Tsukune teaches the method wherein the chamber cleaning process comprises controlling the chamber pressure to 0.5 Torr (see Column 3, lines 6 – 10) and the chamber pre-coating process comprises controlling the chamber pressure to 1 Torr (see Column 3, lines 11 – 18). Tsukune does not explicitly teach that the PECVD system comprises a pressure control system coupled to the chamber to achieve these pressures. However, Ravi teaches just such a limitation (see Column 4, lines 1 – 21 and 66 – 67, and Column 5, lines 1 – 8). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by including a pressure control system as taught by Ravi to have controlled the pressure to the levels taught by Tsukune with a reasonable expectation of success, because Ravi teaches that such a system is known in the art.

**24. Claims 8, 9, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis, and further in view of Mahorowala, et al (Mahorowala, A.P., Babich, K., Petrillo, K., Simons, J., Angelopoulos, M., Patel, V., and Grill, A. "Tunable Anti-Reflective Coatings with Built-in Hard Mask Properties Facilitating Thin Resist Processing," Proceedings of SPIE (4343) : 306 – 316, 2001).**

25. Regarding Claims 9 and 28, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the film on the substrate comprises a Tunable Etch Resistant ARC (TERA) material, and wherein the film comprises a material having a refractive index (n) ranging from approximately 1.5 to approximately 2.5 when measured at a wavelength of at least one of: 248 nm, 193, nm, and 157 nm, and an extinction coefficient (k) ranging from approximately 0.1 to approximately 0.9 when measured at a wavelength of at least one of: 248 nm, 193, nm, and 157 nm. However, Mahorowala teaches just such limitations, wherein PE-CVD is used to deposit TERA films with these properties (see pp. 308 – 311). It would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by depositing a TERA film as taught by Mahorowala with a reasonable expectation of success, because Mahorowala teaches that PECVD is a suitable method for deposition of TERA films.

26. Regarding Claim 8, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the film on the substrate comprises a TERA material, and the film on the new substrate comprises substantially the same TERA material. However, as discussed, Mahorowala teaches the deposition of TERA films from TERA materials via PE-CVD. It would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by depositing a TERA film as taught by Mahorowala on multiple

substrates, because Mahorowala teaches that PECVD is a suitable method for deposition of TERA films and because Ravi teaches that it is well-known in the art to process multiple substrates in a deposition chamber.

**27. Claims 5 – 7, 10, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis, and further in view of Hashizume, et al (United States Patent 6,410,102, hereafter Hashizume).**

28. Regarding Claim 10, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method comprising positioning a dummy substrate on the substrate holder before performing the chamber seasoning process, and removing the dummy substrate after performing the chamber seasoning process. However, Hashizume teaches just such a limitation, wherein a dry etch cleaning process is performed with a dummy substrate (see Column 10, lines 27 – 40, "In order to prevent damage on the … heaters, dummy cylindrical substrates … are set … in the deposition chamber and the inside of the chamber is vacuumized …"). While Hashizume does not explicitly teach removing the dummy substrate before a substrate processing step is performed, it is an inherent feature of a dummy substrate employed in a chamber pre-cleaning process before a substrate processing step that the dummy substrate must be removed before the regular substrate processing begins. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor,

Maydan, Reiss, Satoh, Law and Papasouliotis by using a dummy substrate during the cleaning process as taught by Hashizume with a reasonable expectation of success, because Hashizume teaches that the use of a dummy substrate during dry cleaning processes is well-known in the art, and to have gained the advantages taught by Hashizume, i.e. to prevent damage to the substrate heater during dry etch cleaning.

29. Regarding Claims 12 and 15, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the chamber cleaning process employs $O_2$ and wherein the chamber cleaning process employs Ar. However, Hashizume teaches just such limitations, wherein oxygen and argon are used in addition to a fluorine-containing gas in a chamber cleaning process (see Column 10, lines 27 – 40). It would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by employing $O_2$ and Ar as components in a chamber cleaning process as taught by Hashizume with a reasonable expectation of success, because Hashizume teaches that it is known in the art to do so.

30. Regarding Claims 5 – 7, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the post-process chamber cleaning process uses $O_2$ and Ar, and wherein the method further comprises positioning a dummy substrate on the substrate holder before performing the post-process chamber cleaning process and removing the dummy substrate after performing the post-process chamber cleaning process. However, as discussed, Hashizume teaches all of these limitations for a cleaning process. It would have been obvious to one having

ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by using $O_2$ and Ar in a chamber post-cleaning process that employs a dummy substrate as taught by Hashizume with a reasonable expectation of success, because Hashizume teaches that such a method is well-known in the art.

**31. Claims 19 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis, and further in view of Law, et al (United States Patent 4,960,488, hereafter Law).**

32. Regarding these Claims, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the PECVD system comprises an upper electrode and a translatable substrate holder and the chamber seasoning process includes the chamber cleaning process which further comprises: establishing a first gap between the upper electrode and the translatable substrate holder during a first time; and establishing a second gap between the upper electrode and the translatable substrate holder during a second time, and wherein the first gap is less than or equal to the second gap or wherein the second gap is less than or equal to the first gap. However, Law teaches just such limitations, wherein a multiple dry etch process is used to clean *in situ* a PECVD chamber (see Column 11, Lines 61 – 68, and Column 12, lines 1 – 2) and wherein the first gap is less than the second gap (see Column 12, lines 20 –38). Moreover, Claim 19 as written does not specify that the

second gap established during a second time necessarily occurs *after* the first gap established during the first time – thus, the method taught by Law reads on both Claims 20 and 21. Furthermore, Law states the advantages of using this process, in Column 12, lines 12 – 19, as "thus, while the operation of the present reactor is cleaner than conventional reactors and while cleaning can be done less frequently, the ability to clean both the vacuum system and the reactor chamber rapidly and frequently, if necessary, is very desirable in preventing particulate contamination and in ensuring long-term proper operation of components such as the throttle valve." Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by using the dual-step chamber cleaning process taught by Law to have obtained the advantages taught by Law with a reasonable expectation of success, as Law teaches that such a process is known in the art.

**33. Claims 22, 23, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis, and further in view of Kuwada, et al (United States Patent Application Publication US 2002/0029748 A1, hereafter Kuwada).**

34. Regarding Claim 22, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the PECVD comprises a temperature control system coupled to a substrate holder and the chamber cleaning process comprises controlling the substrate holder temperature between approximately

0 C and 500 C. However, Kuwada teaches just such limitations, wherein a heat lamp or a resistance heater is used to heat the substrate holder (see paragraph [0046]) and wherein the temperature of the substrate holder is held to about 250 C during chamber cleaning (see paragraphs [0080] and [0081]). Moreover, Kuwada teaches, in paragraph [0065], that "after the emitted heat … is transmitted through the transmission window, a back surface of the susceptor is irradiated, and the wafer is heated from the back surface thereof. Since the susceptor … is very thin …, the susceptor is quickly heated, and the wafer load on the susceptor can also quickly be heated to a predetermined temperature." Therefore, Kuwada is implicitly teaching that it is advantageous to have temperature controlled substrate holders in order to precisely control the temperature of the substrate during deposition or processing. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by using a temperature control system coupled to a substrate holder and by performing a cleaning process which comprises controlling the substrate holder temperature to 250 C as taught by Kuwada with a reasonable expectation of success, because Kuwada teaches that is known in the art to do so.

35. Regarding Claim 23, Tsukune in view of Ravi, Taylor, Maydan, Reiss, and Kuwada teaches the method wherein a PECVD system comprises a temperature control system coupled to a substrate holder, but does not explicitly teach the method wherein the substrate holder temperature is controlled between about 0 and about 500 C during a pre-coating process. However, Tsukune does teach, in Column 3, lines 50 –

58, that “the temperature within the chamber [during pre-coating] is set to 350 C.” It would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, and Kuwada by using the temperature control system of the substrate heater as taught by Kuwada to control the temperature during the pre-coating process to about 350 C as taught by Tsukune with a reasonable expectation of success, because a substrate heater element is inherently capable of heating a chamber.

36. Regarding Claim 27, Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the PECVD system comprises a temperature control system coupled to a shower plate assembly and the chamber cleaning process further comprises controlling the shower plate assembly temperature between approximately 0 and 500 C. However, Kuwada teaches just such limitations, wherein a shower plate assembly is heated by various elements during a cleaning process (see paragraphs [0049], [0051], [0054], [0055], and especially [0078]). Moreover, Kuwada teaches, in paragraph [0096], that “the head heating/cooling portion cools the head main body during the film forming process to further enhance reproducibility of the film thickness, and heats the main body during the cleaning process in order to further efficiently remove the reactive byproduct.” Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by including a temperature-controlled showerhead assembly as taught by Kuwada and by controlling the temperature of the

showerhead during cleaning to approximately 150 C as taught by Kuwada to have achieved the advantages taught by Kuwada (i.e., complete cleaning of the showerhead apparatus during the system etch with fluorinated-gas) with a reasonable expectation of success, because Kuwada teaches that such a method of showerhead cleaning is known in the art.

37. **Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis, and further in view of Steger, et al (United States Patent 5,788,799, hereafter Steger)**

38. Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis does not teach the method wherein the PECVD system comprises a temperature control system coupled to a chamber wall and the chamber cleaning process comprises controlling the chamber wall temperature between approximately 0 C and 500 C. However, Steger teaches just such limitations, wherein a chamber wall surface is temperature controlled to ensure fast and efficient cleaning (see Column 4, lines 11 – 33, and Column 5, lines 11 – 32). Steger teaches, in Column 5, lines 23 – 32, that "when the ceramic liner assists in the cleaning of a reactor chamber after the semiconductor substrate has been removed, since the clean rate is typically exponential with temperature, the ceramic liner temperature setting will be as high as is practical, depending on the equipment involved." Steger further teaches, in Column 9, lines 53 – 55, a number of potential cleaning wall temperatures ranging from 65 C to 250 C

utilizing $NF_3$. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Tsukune in view of Ravi, Taylor, Maydan, Reiss, Satoh, Law and Papasouliotis by including a temperature-controlled chamber wall as taught by Steger and by controlling the temperature of the chamber wall during cleaning to 65 to 250 C with a reasonable expectation of success, because Steger teaches that such a method of chamber wall cleaning is known in the art.

### *Conclusion*

39. The examiner cites US Patent 5824375 and US Patent 6042887 as discloses seasoning films and cleaning with silicon precursors and etch gases as claimed.

40. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

41. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID TUROCY whose telephone number is (571)272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792